

# What Constrains Teachers From Using ICT to Support Teaching as Inquiry?

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## Abstract

Government reports indicate that many New Zealand schools have few supports for teaching as inquiry. Recent developments in Information and Communications Technology (ICT), however, appear to provide new tools which could support several aspects of teachers' inquiries, such as digital portfolios and online collaboration platforms. This literature review investigates what barriers there might be for ICT to support teaching as inquiry, primarily in a New Zealand setting. It challenges the prevailing notion that teachers' failure to recognise the potential of technology is the single most critical missing strategy for inquiry development, and shows that a variety of other factors continue to have significance in the literature. The implication of this review is that a variety of strategies appear to be required to support teachers in using ICT for an inquiry approach to teaching, rather than a one-size-fits-all approach.

**Keywords:** *Teaching as Inquiry, ICT, Technology, Digital, Integration, Constraints.*



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## Introduction

In their synthesis, Bolstad et al. (2012) identified four linked strategies needed to support educational information and communication technology (ICT) innovations: inspiration, enabling tools, ICT capability, and support for innovation (Bolstad et al., 2012, p. 56). Of these, the authors identified that inspiration was the most limited at the time, because "there is still insufficient knowledge about how ICT-related thinking and practice can be more consistently connected with the 'big-picture' ideas about future-oriented learning" (Bolstad et al., 2012, p. 57). In the same year, the Education Review Office (ERO) reported that teaching as inquiry needed to be better supported (2012). ERO identified the following four forms of existing teacher inquiry: collaborative inquiry, self review, documented personal reflections, and reflection in action (Education Review Office, 2012, p. 16).

Focusing on the New Zealand school system, the aim of this literature review is to assess the evidence that within this four-strategy model, inspiration is the most significant constraint to the greater adoption of ICT systems to support inquiry-based teaching, and determine the ongoing significance of the other linked strategies. A variety of New Zealand and international studies are evaluated, encompassing both broad surveys and case studies of practice.

## Evaluating Surveys of Teachers

A very large survey of Chinese primary schools used a path model to find a variety of correlations between "internal teacher variables" and teachers' adoption of ICT (Sang, Valcke, van Braak, Tondeur, & Zhu, 2011). The path analysis consisted of multiple regressions to find statistically significant direct and indirect causal links in their data. The internal variables the researchers examined included such factors as pedagogical beliefs and ICT motivation. A key finding of this study was that often, teachers who used ICT for one purpose would use it for others also – for instance, teachers who used ICT in planning lessons or for student management, would more commonly be willing to integrate ICT into their classroom activities. Evaluating discrepancies with other international literature, the researchers suggested cultural factors may have been significant also, such as a general aversion to constructivist principles. This may suggest New Zealand's more multicultural teaching profession could have more diverse challenges in integrating technology to support teaching as inquiry. The authors were cautious about generalising their study, however, because despite the large sample size of 820 teachers, it was not enough to draw significant correlations for the context of China, let alone other countries such as New Zealand. The study suggested that among the teachers surveyed, the variables affecting teachers' support for integrating technology had a direct effect on how much they used



technology for all purposes, including activities supporting elements of teaching as inquiry.

Many of these correlations have been supported across cultures. [Inan and Lowther's \(2010\)](#) study also used a path modelling approach based on a similar survey of 1,382 Tennessee public school teachers, to determine factors related to teachers' professional and classroom uptake of ICT. Although the study did not investigate correlations with different purposes for ICT use individually, it found a variety of direct and indirect correlations with ICT use overall. The most significant correlations with ICT use were computer proficiency, overall support, and teacher readiness. This finding suggests that teachers surveyed needed not just to support and be supported in using innovative technology to conduct teaching as inquiry, but also that many teachers felt they lacked the proficiency with ICT to do so, which may be linked with the ICT capability strategy.

Other large international surveys have given more support to non-individualistic factors, including the technology used and the organisation itself. In [Meneses, Fàbregues, Rodríguez-Gómez and Ion's \(2012\)](#) study, 1,405 teachers in Spanish primary and secondary schools reported on their professional use of the Internet outside the classroom. Their study concluded that there was a strongly significant correlation between teachers' ICT capability and using the Internet to support better teaching. It also found a weaker correlation between ICT capability and using the Internet for management tasks. In addition, the study used a digital divide approach to attempt to measure how these are affected by differential access to technology. From this they concluded that organisational development and technological factors, such as the level of Internet access, were significant predictors of how much the Internet was used by teachers outside the classroom. This indicates that along with ICT capability, the provision of enabling tools and schools' support for innovation had some effect on teachers' usage of ICT to support activities like teaching as inquiry.

More modestly-sized surveys in the New Zealand context have yielded information about how our local context may differ from international evidence. [Ward and Parr \(2010\)](#) found that in four well-resourced and ICT-committed New Zealand secondary schools, there was little correlation between pedagogical and professional ICT use. Although skill level in using ICT was not significantly correlated with pedagogical uses of ICT in the path analysis, it was significantly correlated with professional, preparation, and personal uses of ICT by the teachers in the study. This was also the only factor that was broadly correlated, even though the authors found several other factors to be significant for specific uses of ICT. Consistent with international research, the authors found that these factors included a variety of personal variables, such as teacher readiness. Because the study was set in schools that had a significant existing investment in ICT, it is plausible that the sample may be skewed towards more inspirational environments. In this study, the level of teacher participation in professional development, where some of this inspiration could be assumed to be taking place, was correlated with ICT use for lesson preparation, but not core professional use. The bias in the sampling of schools with better ICT supports may explain why no evidence was found that the factors barriers to use or teacher perception of disadvantages were statistically significant antecedents for any type of ICT use, in contrast with international research. Overall, the study provides evidence that

the New Zealand teachers who are more skilled in using ICT, tended to use ICT for professional purposes more, such as teaching as inquiry.

Both [Ward and Parr's \(2010\)](#) New Zealand survey and [Inan and Lowther's \(2010\)](#) survey from the United States of America identified identical strategies as being missing – namely, support for innovation and ICT capability. The support for innovation strategy was additionally supported by evidence from researchers in China ([Sang et al., 2011](#)) while a study from Spain identified the ICT capability and enabling tools strategies to be significant ([Meneses et al., 2012](#)). [Ward and Parr \(2010\)](#), however, only found statistically significant evidence from New Zealand that the enabling tools strategy was missing in the pedagogical use of ICT, but not professional use. All surveys examined identified the importance of recognising a variety of obstacles in different contexts. None provided specific support for the inspiration strategy.

Survey data provides a broad overview of correlations in current practice; however, it is limited in establishing causality, the direction of causality, and any underlying or confounding variables not considered by the researchers, among other factors. Qualitative case studies, therefore, provide more information on these factors in specific instances.

## Evaluating Examples of Practice

Communities of practice, facilitated through tools such as learning management systems or other forms of new media, provide an important set of case studies for evaluating how new media can facilitate collaborative inquiry, as well as providing a digital record for review and reflection.

In one recent review of an Australian university business school's three largely-failed attempts to introduce a learning management system, which had as its primary intention the improvement of teaching ideas and practices, the authors observed three key obstacles. These were that technology was not fit for purpose, that teachers did not trust how the technology was being used, and time-jealousy, that is, the time spent engaging with the digital system would not yield commensurate rewards ([Houghton, Ruutz, Green, & Hibbins, 2015](#)). Among the specific issues raised were concerns about confidentiality, performance management, time taken to engage with the platform, lack of immediately positive outcomes for students, and the ease-of-use of the system – some of which touch on the teachers' and organisations' support for innovation. Although set in a tertiary context, and set in another country, it would seem to challenge Bolstad et al.'s (2012) statement that the "types and quality of ICT tools" used in New Zealand settings are a strategy that has been accomplished already with "better infrastructure and access" alone. Rather, interviews with teachers conducted by [Houghton et al. \(2012\)](#) suggested that the systems' designs were at fault to an extent, highlighting the importance of the enabling tools strategy. Teachers' use of ICT tools to support teaching as inquiry is constrained by both access to and quality of those tools.

The applicability of these findings to a New Zealand school context can be partially assessed by its parallels to the ERO report (2012), which found many of the same factors applied to schools' systems for teacher inquiry. It did not, however, review how many of these systems were specifically ICT-based. Although Houghton et al. highlighted the need for "spontaneous" inquiry

(2015, p. 14), ERO suggested that systems often failed to support “reflection in action” (2012, p. 25). Likewise, when teachers had a “lack of trust” in the system in [Houghton et al.’s \(2015\)](#) study, the ERO found “contrived inquiry” to be the result (2012, p. 25). These findings suggest that either helpful systems for teachers to conduct inquiries are not available to be implemented in schools, or that schools are not supporting such systems.

An argument could be made for more decentralised communities to support teaching. One review of three online communities for professional learning – two set in an Australian context and one international website – found that almost two-thirds of the teachers in these communities used them for professional development, with the remainder primarily accessing some form of emotional support ([Duncan-Howell, 2010](#)). The study showed that although teachers’ typical professional development took the form of traditional courses, those teachers who engaged in these online communities typically gained a lot of additional development by taking part in the group, such as by sharing thoughts or collaborating. The need for “practical and authentic” ([Duncan-Howell, 2010, p. 338](#)) professional learning was highlighted as a key need by the teachers involved with the survey, and generally was agreed to be an advantage of the learning communities surveyed. Members indicated that they had used the tools to improve their teaching practice ([Duncan-Howell, 2010, p. 337](#)); however, it is unclear to what extent this was a result of these learning communities facilitating professional and critical inquiry, as opposed to merely copying another teacher’s strategies or ideas.

Because the systems were non-institutional, trust was less of an issue, and the technology appeared fit for the purposes of those who were members of the communities, including a range of primary teachers, secondary teachers, and other staff. It is unclear how this would suit the needs of all teachers and staff, however, as the study identified a clear learning-method preference as being dominant in the communities: namely, needing “broader social interaction that can be provided from within their workplace” ([Duncan-Howell, 2010, p. 332](#)). Interestingly, time was listed as both an advantage and disadvantage of participation in these communities. Overall, the study suggests that for those people who were successfully integrated into these communities, teachers saw potential in using technology to facilitate their development – which also highlights the importance of the inspiration strategy. In addition, the design of the tool and the dispositions of those using it could be helpful factors to support teaching as inquiry for those teachers. There is little evidence on the uptake of such technologies in a New Zealand context. The 2012 ERO report did not generally assess such inter-school resources for inquiry, but rather focused only on school-level supports.

[Levin and Wadmany’s \(2008\)](#) longitudinal study of six Israeli teachers, consisting of experimental workshops, interviews, and observations, confirms (on a qualitative level) that the integration of ICT can be “a source of inspiration and professional renewal” for teachers ([Levin & Wadmany, 2008, p. 258](#)). The authors determined that the source and nature of the technological processes being engaged with had an ongoing developmental impact on how teachers adapted technological tools for their professional and pedagogical needs. Each of the teachers represented a unique and complex developmental pattern, both supported by and supporting a process of teaching as inquiry.

Although the study was set a non-New Zealand context, it provides further evidence that with the right personal and professional development, which Bolstad et al. (2012) refer to as ICT capability or support for innovation, teachers can use ICT as effectively for teaching as inquiry. A limitation of this finding is that the teachers had some existing motivation to use ICT, having signed up to a longitudinal professional development programme. The divergences in how each of the educators developed together with ICT, when considered with the scattergun antecedents discussed in [Ward & Parr’s \(2010\)](#) survey, provide further evidence that the strategies that should be employed to support ICT use in teaching as inquiry are as complex and unique as the teachers themselves. [Levin & Wadmany \(2008\)](#) discuss how this idea echoes constructivist learning pedagogies, and in turn, challenges professional development leaders to consider the vast range of influences on an individual teachers’ environment, rather than offer a one-size-fits-all prescription for involving ICT systems to support teaching as inquiry.

Though examples from practice in a New Zealand context are scant, there is evidence that many schools have used digital tools such as Google Docs positively to develop teacher inquiries, especially to support the achievement of priority learners. In one case study, three primary schools developed a shared inquiry based around the Pasifika principle of *talanoa* (sharing ideas) as well as the “spirals of inquiry” framework, that leads to improvements in achievement for the priority learners (Ministry of Education, 2016). This process enabled teachers to work with “less isolation, increasing the power of their inquiry” while drawing on both Pasifika values and evidence-based practice approaches to support learners (Ministry of Education, 2016). Evidentially, this highlights the need for the inspiration strategy, as well as inter-school shared values as useful supports to facilitate the use of this technology for teaching as inquiry.

## Discussion of Findings and Limitations

Some general conclusions can be drawn from this body of evidence. First, there are sources of inspiration for how ICT can be used, as well as why it should be used, and that at least some teachers appear to find these helpful. This can be seen in literature such as the Ministry of Education’s (2016) case study as well as [Duncan-Howell’s \(2010\)](#) online communities of practice. It remains unclear to what extent such effective tools are adopted among teachers in New Zealand, but there is little evidence that teachers are not willing to draw on such resources.

Second, there is some evidence that a wide variety of personal, organisational, and technological factors can potentially influence an individual teacher’s use of ICT for teaching as inquiry. [Levin and Wadmany’s \(2008\)](#) research suggests a need to treat each teacher’s interaction with changing technology as a personal, ongoing journey, rather than assume any specific fix. This is supported by the wide range of correlations found in surveys conducted within New Zealand and internationally. Several significant correlations between the use of ICT for teaching as inquiry and factors unrelated to inspiration-based strategies continue to be identified as significant in the literature.

Almost every piece of literature reviewed highlighted a need for meaningful professional development to allow teachers to see not only the potential of ICT for teaching as inquiry, but also to

be confident in their ability to use it fully and authentically in their specific teaching contexts. Where tools to facilitate inquiry have been implemented by institutions, evidence exists, such as in the reports by ERO (2012) and [Houghton et al. \(2015\)](#), that they have often provided more of a contrived inquiry based on time-jealousy, as opposed to a critically reflective environment for inquiry.

Therefore, although this review has found a significant body of support for the four elements of Bolstad et al.'s framework of ICT integration strategies, there is clear evidence in the literature that when this ICT is integrated to support an inquiry approach to teaching, their weighting of the various aspects of the model should be treated with caution. Where the literature has identified issues with inspiration, this has almost universally been closely linked with a lack of support, capability, or functionality of the ICT tool. It is therefore important not to identify any particular solution to the challenge of improving teaching as inquiry practices in New Zealand schools, but rather to consider a holistic approach, one that is based on the complex and evolving interplay of relevant factors. One key limitation of this study is that most relevant literature in this field draws on evidence from overseas. Where studies have been conducted in New Zealand that have investigated how teachers use ICT for teaching as inquiry, they have often focused on individual examples of practice or school contexts. Broader studies are needed to assess how the New Zealand education system's overall culture contributes to how teachers use ICT, including understanding why New Zealand's teachers might appear to be more discriminating in the purposes for which they use ICT compared with international studies. In addition, with the fast-changing pace of technology, it is likely that the nature of the technology itself has developed significantly over the period of the studies being reviewed. More ongoing research into how teachers are using technology, especially to support teaching as inquiry in New Zealand, would likely yield further insight into this phenomenon.

## References

- Bolstad, R., Gilbert, J., McDowall, S., Bull, A., Boyd, S., & Hipkins, R. (2012). Supporting future-oriented learning and teaching: A New Zealand perspective. Wellington, New Zealand: New Zealand Council for Educational Research Press. Retrieved from <http://www.educationcounts.govt.nz/publications/schooling/109306>
- Duncan-Howell, J. (2010). Teachers making connections: Online communities as a source of professional learning. *British Journal of Educational Technology*, 41(2), 324-340. doi:10.1111/j.1467-8535.2009.00953.x
- Education Review Office (2012). *Teaching as Inquiry: Responding to Learners*. Available at <http://www.ero.govt.nz/publications/teaching-as-inquiry-responding-to-learners/>
- Houghton, L., Ruutz, A., Green, W., & Hibbins, R. (2015). I just do not have time for new ideas: resistance, resonance and micro-mobilisation in a teaching community of practice. *Higher Education Research and Development*, 34(3), 527-540. doi:10.1080/07294360.2014.973834
- Inan, F., & Lowther, D. (2010). Factors affecting technology integration in K-12 classrooms: a path model. *Educational Technology Research and Development*, 58(2), 137-154. doi:10.1007/s11423-009-9132-y
- Levin, T., & Wadmany, R. (2008). Teachers' views on factors affecting effective integration of information technology in the classroom: Developmental scenery. *Journal of Technology and Teacher Education*, 16(2), 233-263. Available from <http://www.learntechlib.org/p/22950/>
- Meneses, J., Fàbregues, S., Rodríguez-Gómez, D., & Ion, G. (2012). Internet in teachers' professional practice outside the classroom: Examining supportive and management uses in primary and secondary schools. *Computers and Education*, 59(3), 915-924. doi:10.1016/j.compedu.2012.04.011
- Ministry of Education (2016). Collaborative inquiry using Talanoa – A communication process. Retrieved from <http://elearning.tki.org.nz/Teaching/Snapshots-of-Learning/Collaborative-inquiry-using-Talanoa>
- Sang, G., Valcke, M., van Braak, J., Tondeur, J. and Zhu, C. (2011). Predicting ICT integration into classroom teaching in Chinese primary schools: exploring the complex interplay of teacher-related variables. *Journal of Computer Assisted Learning*, 27(2), 160-172. doi:10.1111/j.1365-2729.2010.00383.x
- Ward, L., & Parr, J. (2010). Revisiting and reframing use: Implications for the integration of ICT. *Computers and Education*, 54(1), 113-122. doi:10.1016/j.compedu.2009.07.011